J. New York Entomol. Soc. 103(3):302–310, 1995

THE BEE GENUS *RHECTOMIA* (HYMENOPTERA: HALICTIDAE): DISCOVERY OF THE MALE AND TWO NEW SPECIES

Michael S. Engel

Department of Entomology, Comstock Hall, Cornell University, Ithaca, New York 14853

Abstract.—A redescription of the augochlorine bee genus *Rhectomia* is presented and the male described for the first time. The genus *Corynurella* is found to be a junior synonym of *Rhectomia* and its sole species, *Corynurella mourei* Eickwort, is transferred to *Rhectomia.* Two new species are recognized: *Rhectomia harrisoni* and *R. liebherri.* A key is provided for the identification of the currently recognized species. Relationships within the genus are briefly discussed.

Key words: Augochlorini, *Corynurella,* Halictidae, new species, *Rhectomia,* synonymy.

The rare sweat bee genus *Rhectomia* is known from Argentina, Brazil, Paraguay, and Peru. The genus is a member of the New World tribe Augochlorini, most readily characterized by the apical cleft of tergum five in the female and the absence of a pygidial plate in the male. While the biology of the augochlorine genera is fairly well studied, nothing is known of *Rhectomia* species. The genus was erected by Moure (1947) for the new species *Rhectomia pumilla* and was described on the basis of the female only. Later, Eickwort (1969), in a generic revision of the Augochlorini, presented the description of a new genus and species, *Corynurella mourei,* sister to *Rhectomia.* Eickwort's new genus was based on both sexes; however, he recognized that with the discovery of the male for *Rhectomia* ". . . *Corynurella* should perhaps be considered a subgenus of *Rhectomia*" (Eickwort, 1969:400).

The present study gives descriptions of the recently recognized male for *Rhectomia* and two new species. The characters used by Eickwort (1969) to separate *Corynurella* from *Rhectomia*—size of the stigma and marginal cell—are found to intergrade, and *Corynurella* is best regarded as a synonym of *Rhectomia.*

The following abbreviations are used for institutions: AMNH, American Museum of Natural History, New York; CNC, Canadian National Collection, Ottawa, Canada; CUIC, Cornell University Insect Collection; KSEM, Snow Entomological Museum, University of Kansas; and PACK, L. Packer private collection.

Genus *Rhectomia* Moure

Rhectomia Moure, 1947, Publicações Avulsas Museu Paranaense no. 3:9. Type species: *Rhectomia pumilla* Moure, 1947, monobasic and original designation. Eickwort, 1969:400.

Corynurella Eickwort, 1969, University of Kansas Science Bulletin 48:398. Type species: *Corynurella mourei* Eickwort, 1969, monobasic and original designation. **New synonymy.**

Female: Rather small, *Dialictus*-like bees. *Head*: Epistomal sulcus forming slightly obtuse to right angle (measured between lateral clypeo-genal sulcus and dorsal clypeo-genal sulcus with angle opening towards compound eye: *sensu* Eickwort, 1969). Clypeus and supraclypeal area slightly protuberant in lateral aspect, both gently rounded. Preoccipital ridge rounded. Hypostomal ridge carinate and projecting beyond posterior margin of head, anterior angle broadly rounded; hypostomal bridge suture short; hypostomal length normal (longer than wide). Inner orbit of compound eye weakly emarginate; eyes moderately convergent below, more so than above; eye hairs short. Ocelli not enlarged. Vertex swollen behind ocelli. Scape long and slender; flagellomere 1 longer than wide; flagellomeres 2 and 3 equal in length, each shorter than remaining flagellomeres. Labral distal process narrowly triangular apically, with short broad base; basal elevation bilobed or orbicular and protuberant in profile. Mandible normal, subapical tooth weak. Base of galea distal to base of stipes, galeal comb present and well developed. Maxillary palpus normal, all segments of roughly equal length. Prementum not narrowed or elongated. Salivary plate with V-shaped brace. Glossa short. *Mesosoma*: Pronotal lateral angle strongly produced, carinate anteriorly; dorsal ridge carinate; lateral ridge carinate or sharply angled. Mesoscutum broadly rounded; mesoscutal lip produced over pronotum, low and rounded. Tegula semi-oval, smooth, and translucent. Propodeal triangle long, weakly impressed; dorsal ridge of propodeum rounded; lateral ridge rounded; propodeal pit narrow. Marginal cell acute at apex. Anterior basitarsal brush absent. Inner hind tibial spur pectinate, teeth rounded. Scopa formed on hind femur and distal half of trochanter by long, plumose hairs. Basitibial plate narrowly rounded, moderately sized, and well defined on all edges. *Metasoma*: Pseudopygidial area of tergum V semi-translucent and narrowly divided.

Male: As in the female except for the characteristics discussed below. *Head*: Clypeus and supraclypeal area slightly more protuberant. Scape shorter and wider than in female; flagellomere 1 and 2 of roughly equal length, each shorter than remaining flagellomeres; antenna moderately long, reaching back to scutellum. Labral basal area shorter than that of female; basal area low in profile, without elevation; distal process absent. *Mesosoma*: Inner hind tibial spur serrate. *Metasoma*: Elongated, but not petiolate. Pygidian plate of tergum VII absent. Gradulus of tergum VII absent. Anal lip of proctiger fringed with microtrichae, without anal filaments. Apical margins of sterna III–IV unmodified. Apical margins of sterna V and VI notched. Spiculum of sternum VIII narrow. Ventral bridge of gonobase broad, dorsal lobes strong. Basal process of gonostylus small, with setae. Penis valve without ventral prong or keel. Inner margin of volsella with depression.

Remarks: Most *Rhectomia* species can be quickly distinguished from other augochlorines by the peculiar pronotal dorsal ridge structures (Figs. 4–6), but this is not universal for the genus. The combination of the broadly rounded mesoscutum, strongly produced pronotal lateral angle, carinate dorsal ridge of the pronotum, pectinate inner hind tibial spur, swollen vertex, and weak eye emargination separates *Rhectomia* from other augochlorine genera. *Rhectomia* is apparently sister to *Rhinocorynura* as both genera share the fringe of microtrichae on the proctiger. *Rhectomia* can be separated from *Rhinocorynura* by the carinate dorsal ridge of the pronotum (the ridge is strongly lamellate in *Rhinocorynura*), the mesoscutal lip being low and rounded (this structure is high and sharply angled or carinate in *Rhinocorynura*), and

the lack of a keel on the ventral face of the penis valve. Both genera occupy a basal position in augochlorine phylogeny, near *Halictillus* and *Corynura,* as evidenced by the presence of a galeal comb, a feature lost in higher augochlorines. In a few males flagellomere 1 is slightly shorter than 2, each still shorter than the remaining flagellomeres.

Identification: The following changes for both females and males should be made to Eickwort's key to the genera and subgenera of Augochlorini (1969) in order to identify correctly *Rhectomia* as it is understood here; couplet 21 for each should read:

21. Pronotal dorsolateral angle produced, strongly carinate anteriorly and laterally; dorsal ridge carinate, usually with medial interruption placing the ridge on a distinctly separate plane from the pronotal lobe; mesoscutum broadly rounded and produced over pronotum, low and sharply angled; preoccipital ridge rounded. . . . . .*Rhectomia*
Pronotal dorsolateral angle not produced and not strongly carinate anteriorly; if lateral angle produced, dorsal ridge carinate; dorsal ridge never interrupted medially; lateral ridge, mesoscutum, and preoccipital ridge variable. 23

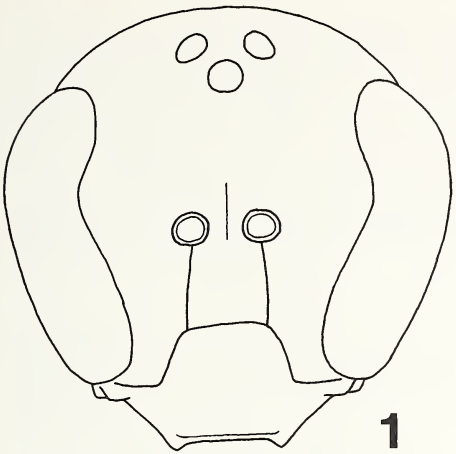
Couplet 22 should be deleted altogether.

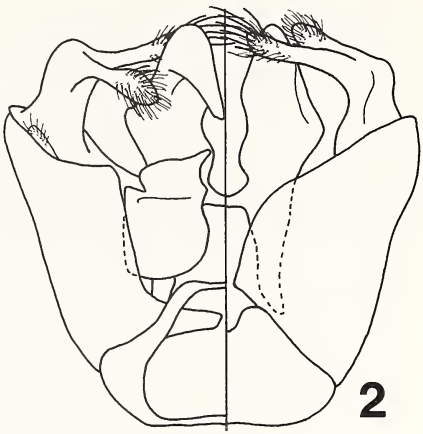
A revised key to the genera and subgenera of Augochlorini is currently being prepared by the author.

Rhectomia harrisoni, new species
Figs. 1–2, 4

Female: Total body length 6.22 mm; forewing length 4.4 mm. Head about as wide as long. Epistomal sulcus roughly orthogonal (see generic description). Labral basal elevation orbiculate with slight median impression, not distinctly bilobed as in *R. pumilla* or *R. liebherri.* Frontal line weak but present between and slightly above antennal sockets. Gena as wide as compound eye in profile (genal width 0.44 mm). Distal half of clypeus projecting beyond lower tangent of compound eyes. Scape 0.7 mm in length. Vertex length 0.3 mm (measured from between lateral ocelli to preoccipital ridge). Pronotal lateral carina extending ventrally to junction between pronotum and propleuron. Pronotal dorsal ridge as in Fig. 4, weakly concave immediately behind lateral angle, with short, broad extension of dorsal ridge behind concavity; dorsal ridge with strong medial interruption setting the pronotal lobe on distinctly separate plane from dorsal ridge. Propodeal triangle roughly equal to scutellum in length, each longer than metanotum. Intertegular distance 1.16 mm. Second submarginal cell not narrowed anteriorly. Third submarginal cell wider than second, first approximately equal to width of third and second combined. 1r-m distad of 1m-cu, offset by about four times the width of a vein. 2r-m distad of 2m-cu, 2m-cu joining third submarginal cell two thirds of way through cell. Protrochanter approximately 3 times as long as wide; mesotrochanter approximately 2 times as long as wide; metatrochanter as long as wide. Inner hind tibial spur with three teeth (not including apex as a tooth), teeth decreasing in length distally.

Distal third of clypeus testaceous, remainder of clypeus and head dark metallic green with coppery reflections. Labrum brown. Mandible dark brown basally, testaceous medially, with reddish-brown tip. Scape yellow-brown, remainder of antenna dark brown. Face generally impunctate and shining; scattered weak punctures on upper half of face; clypeus with a few weak punctures basally. Pronotal lateral sur-





Figs. 1–2. *Rhectomia harrisoni* n. sp. 1. Frontal aspect of female head. 2. Male genitalia. Left half = ventral aspect; right half = dorsal aspect.

face brown, smooth and shining, finely imbricate just below pronotal lobe; propleuron brown; pronotal dorsal surface darker brown with strong metallic green highlights. Mesosoma, exluding pronotum, brown to red-brown with strong metallic green highlights. Mesoscutum, scutellum, metanotum, and pleura with very few scattered weak punctures, smooth and shining. Median line, parapsidal lines, and median scutellar impression weak. Propodeal triangle smooth and shining. Lateral surfaces of propodeum impunctate and imbricate. Tegula light brown, darker along inner margin. Forecoxa and forefemur brown, remainder of leg light brown; legs of mesothorax and metathorax brown. Basitibial plate light brown with reddish-brown rim. Metasoma brown. Terga impunctate.

Face with short, plumose, appressed golden hairs and scattered simple hairs. Vertex with scattered short simple hairs; hairs longer on gena; postgena with few hairs; row of short simple hairs along hypostomal ridge. Short simple hairs scattered over mesoscutum, a few longer hairs interspersed among shorter ones. Scutellum with short simple hairs and scattered longer brancheal hairs. Metanotum with shorter hairs denser than on scutellum, but not obscuring surface; long branched hairs present as on scutellum. Pleura with scattered short branched hairs and fewer long branched hairs, longer hairs becoming more dense ventrally. Lateral surfaces of propodeum with scattered long simple and branched hairs, also with scattered short simple hairs; posterior surface with shorter hairs more sparse and longer hairs with more branches. Inner face of metatibia without hairs, remainder densely covered with stiff branched hairs, branches short; similar hairs on outer face of metabasitarsus, but not as dense. Terga with few simple hairs; hairs more dense and becoming branched laterally on terga II–VI, branches short. Hairs more numerous dorsally on terga IV–VI. Hairs long and with short branches on sterna; hairs on sternum I with long branches.

Male: Total body length 7.32 mm; total forewing length 4.76 mm. Structure as in the female except as follows: Head longer than wide. Clypeus much more protuberent; distal half projecting below lower tangent of compound eyes. Gena as wide as compound eye in profile. Vertex slightly more swollen than in female (length 0.36 mm). Scape short (length 0.54 mm). Intertegular distance 1.22 mm. Inner hind tibial spur serrate. Sternum I longer than wide. Notch on apical margin of sternum V wide with short medial projection; dense erect setae on projection; patch of dense erect setae on inner borders of notch. Genital capsule as in Figure 2. Volsella with short median, apical hook on digitus. Ventral gonostylar process broader distally than basally, coming to a pointed apex.

Integument coloration and sculpturing as in the female except as follows: Distal half of clypeus testaceous. Mandible yellow-brown with red tip. Outer surfaces of meso- and metatibiae brown, remainder as in female. Metasoma coloration variable. Allotype male with tergum I brown with apical margin yellow-brown. Terga II and III each with basal band of yellow-brown, apical margins semi-translucent, remainder brown. Terga IV–VII brown with semi-translucent apical margins.

Pubescence as in the female except for usual sex differences. Metatibia and metabasitarsus with scattered long, simple hairs.

Type Material: Holotype female, Brazil, Mato Grosso, Itaum, Dourados, March 1974, M. Alvarenga (KSEM). Allotype male, same data as holotype (KSEM). One paratype female, Paraguay, Villarrica, 3 December 1951, F.H. Schade (KSEM). One paratype male, Paraguay, Villarrica, February 1938, F. Schade (KSEM). One paratype female [macrocephalic], Paraguay, Villarrica, September 1937, F. Schade (KSEM). One paratype male, Paraguay, Itapua, Pirapo NE of Encarnación, 29 December 1971, L. Peña (CUIC). One paratype male, same data as holotype (CUIC). Two paratype males, Paraguay, Villarrica, January 1938, F. Schade (CUIC). One paratype male, Paraguay, Caaguazu, Coronel Oviedo, 21 December 1971, L. Peña (AMNH).

Additional Material: One male, Argentina, Misiones Prov., Iguazu NP, Cent. Ecol., 24 December 1990 to 6 January 1991, S. & J. Peck, 90/131, Forest edge FIT [flight intercept trap], 180 m (CNC). One male, Paraguay, Caaguazu, Coronel Oviedo, 21 December 1971, L. Peña (PACK).

Remarks: Males of this species vary in the coloration of the metasoma, from having the terga completely brown to the basal two terga being completely yellow-brown. Additionally, the Argentine male has more of a blue-green color to the head and mesosoma than the other specimens; however, all of the structual characteristics and the genitalia are identical. One paratype female in CUIC is macrocephalic compared to the remaining specimens (measurements for macrocephalic female: genal width 0.72 mm; vertex length 0.44 mm). Head polymorphism is one possible indication of social behavior and in some primitively eusocial sweat bees it is associated with caste development (e.g., Sakagami and Fukushima, 1961). Such head polymorphism is also known from other augochlorine genera (Sakagami and Moure, 1965). Lastly, there are three mites on the left hindwing of the holotype. Associations between mites and sweat bees are common, although poorly understood (Eickwort, 1979, 1994).

Etymology: This species is named in honor of Dr. Richard G. Harrison, of Cornell University, for his aid and guidance of my work on the Augochlorini.

Figs. 3–6. Pronotal lateral angles and dorsal ridges of *Rhectomia* species, dorsal aspect, left side. 3. *Rhectomia liebherri* n. sp. 4. *Rhectomia harrisoni* n. sp. 5. *Rhectomia mourei* (Eickwort). 6. *Rhectomia pumilla* Moure.

Rhectomia liebherri, new species
Fig. 3

As in *R. harrisoni* except as follows:

Female: Total body length 6.32 mm; forewing length 4.8 mm. Epistomal sulcus slightly obtuse (see generic description). Labral basal elevation bilobed. Frontal line weakly carinate between antennae, replaced by weak impression above towards median ocellus. Scape length 0.7 mm. Vertex not quite as long, length 0.22 mm. Pronotal lateral ridge sharply angled, ridge not reaching juncture between pronotum and propleuron; dorsal ridge straight (Fig. 3), without concavity or extensions as present in the other species; medial interruption absent. Propodeal triangle slightly longer than scutellum. Intertegular distance 1.18 mm. Inner hind tibial spur with four teeth.

Overall body coloration darker than in *R. harrisoni.* Labrum dark brown. Clypeus and supraclypeal area dark brown with green highlights; mandible dark brown. Scape dark brown. Face punctate; punctures separated by puncture width; punctures weaker and sparser on clypeus and supraclypeal area; punctures disappearing on vertex. Mesosoma dark brown with strong metallic green highlights; highlights weaker on propodeum. Propodeal triangle finely imbricate and not shining. Legs brown. Basitibial plate not lighter in color than remainder of leg. Metasoma entirely dark brown.

Face without appressed plumose hairs, with scattered short, simple hairs. Remainder of pubescence as in *R. harrisoni.*

Male: Unknown.

Type Material: Holotype female, Brazil, São Paulo, Serra da Bocaina, S. Jose Barreiro, 1650 m, November 1968, M. Alvarenga (KSEM). Two paratype females, same data as holotype (KSEM). One paratype female, same locality data as holotype but date October/November 1969, Alvarenga and Seabra (CUIC). One paratype female, Brazil, São Paulo, Serra da Bocaina, S. Jose Barreiro, 1960 m, November 1970, M. Alvarenga (CUIC).

Remarks: This species is notable for the lack of a medial interruption in the pronotal dorsal ridge, the sharply angled lateral ridge not extending all the way to the propleuron, and its dark color.

Etymology: This species is named in honor of my advisor Dr. James K. Liebherr, of Cornell University, for his assistance and advice during my studies of neotropical sweat bees.

Rhectomia mourei (Eickwort), **New Combination**
Fig. 5

Corynurella mourei Eickwort, 1969, University of Kansas Science Bulletin 48:514.

Remarks: Eickwort (1969) provided a detailed description of this species in his seminal work on the tribe Augochlorini. A complete redescription of the species is not needed. *R. mourei* is known from Southern Brasil and Peru. The holotype female, allotype male, and several paratypes are in KSEM (examined). Three additional females and one male (not paratypes) are in CUIC, with the following locality information: Females, Rio de Janeiro, Brazil, October 1938, Yellow Fever Service, MES Brazil, R.C. Shannon; 2 from Brazil, Guanabara, Represa Rio Grande, May 1971, M. Alvarenga & F. M. Oliveira. Male, Brazil, Guanabara, Repressa Rio Grande, July–August 1972, M. Alvarenga.
Diagnosis: Labral basal elevation orbicular. Distal third of female clypeus yellow-brown. Face with short, plumose, appressed hairs. Pronotal dorsal ridge as in Figure 5, weakly concave immediately behind lateral angle followed by a short, broad extension (structure similar to that in *R. harrisoni*), with medial interruption as described for *R. harrisoni* except not as strong. Mesosoma reddish-brown with green hints. Propodeal triangle with fine concentric striae and shining. Female metasomal terga I–III completely testaceous. Male terminalia figured by Eickwort (1969:his figures 335–336, p. 483).

Rhectomia pumilla Moure
Fig. 6

Rhectomia pumilla Moure, 1947, Publicações Avulsas Meseu Paranaense no. 3:9.

Remarks: Moure (1947) described this species in detail and a redescription is not needed at this time. The holotype female is in the Moure Collection, Universidade Federal do Paraná, Curitiba, Brazil, and was not available for study. The locality data given for the type series (holotype and one paratype) by Moure is as follows: Brazil, Curitiba, Pr. 900 m, 30 October 1939 and November 1939, J. S. Moure (on flowers of a small Euphorbiaceae). The specimen at my disposal has the following locality information: Female, Nova Teutonia, Santa Catarina, Brazil, December 1952, F. Plaumann (KSEM).
Diagnosis: Labral basal elevation distinctly bilobed. Labrum and mandibles dark brown. Clypeus entirely dark brown with some green highlights basally. Face without appressed, plumose hairs. Pronotal structure as in Figure 6, strongly concave behind lateral angle, followed by a moderately-sized, thin lateral extension, with medial interruption as described for *R. harrisoni.* Eickwort (1969) has also figured the distinctive pronotal dorsal ridge for *R. pumilla* (his figure 185). Propodeal triangle imbricate and not shining. The male for this species remains undiscovered.

Two additional species are known from only one male each. The locality information for these two is as follows: Peru, Avispas, 156 km from Puerto Maldonado, Madre de Dios Prov., 1–15 October 1962, L. E. Peña (CUIC); and Brazil, Minas Geraes [sic], Santa Barbara, 1,450 m, Serra do Caraca, March 1971, F. M. Oliveira (KSEM). The male from Santa Barbara is similar to *R. liebherri,* but has a distinctly carinate pronotal lateral ridge and a more punctate face and mesoscutum.

Lastly, one undescribed species is known to me on the basis of one female. This specimen is similar in character to *R. harrisoni* except the head is longer than wide and the propodeal triangle has fine striations radiating from the basal margin. The locality data for this female are as follows: Brazil, Nova Teutonia, Santa Catarina, 18 February 1954, F. Plauman (KSEM).

KEY TO THE DESCRIBED SPECIES OF *RHECTOMIA*

This key is for males and females. Characters used in the key are hypothesized to be the same for the males of *R. liebherri* and *R. pumilla* as they are in the females of these species.

1. Pronotal lateral ridge forming a distinct carina which extends ventrally to the juncture between the pronotum and propleuron; face with short, plumose, appressed hairs. 2
   Pronotal lateral ridge carinate or sharply angled, not extending down to propleuron; face without such appressed hairs. 3
2. Pronotal lateral surface behind lateral ridge with strong dorso-ventral striations, lateral ridge as in Figure 5; labral basal elevation orbicular, with very slight medial impression; metasomal terga I–III testaceous (females only: males are variable for this character); propodeal triangle with very fine striae. . . . . *mourei*
   Pronotal lateral surface behind lateral ridge smooth, lateral ridge as in Figure 4; labral basal elevation distinctly bilobed; metasomal terga dark brown to black (females only: males are variable for this character); propodeal triangle smooth. . . . . *harrisoni*
3. Pronotal dorsal ridge strongly concave just behind lateral angle and forming short extension or flange just behind concavity (Fig. 6). . . . . *pumilla*
   Pronotal lateral ridge straight, not interrupted by concavity or flange (Fig. 3) . . . *liebherri*

RELATIONSHIPS

It is too early at this time to present an analysis of the internal phylogeny for *Rhectomia.* However, a few observations on relationships can be made. Based on the pronotal structure of other basal augochlorine genera (e.g., *Rhinocorynura, Halictillus,* and *Corynura*), R. liebherri would appear to be the basalmost species currently recognized. The three undescribed species along with *R. harrisoni, R. mourei,* and *R. pumilla* all share an extended pronotal lateral carina which reaches the ventral border near the propleuron. This character is derived within the genus and separates these species from *R. liebherri.* The two undescribed males, while having the extended pronotal lateral carina, have unmodified pronotal dorsal ridges and are therefore basal with respect to a clade containing *R. harrisoni, R. mourei, R. pumilla,* and the undescribed Brazilian female. The complex structure of the pronotal dorsal ridge (Figs. 3–6) seemingly forms a transition series from the plesiomorphic condition seen in *R. liebherri* (Fig. 3) and the undescribed males, to the more complex structures seen in the remaining species (Figs. 4–6). It is difficult to determine whether the pronotal dorsal ridge of *R. mourei* is intermediate between *R. liebherri* and a clade containing *R. harrisoni, R. pumilla,* and the undescribed female, or if this species is more closely aligned with *R. harrisoni* and the undescribed female species. In the first scenario, the three species grouped all share a strong lateral projection even though the overall structure of the curve is similar in *R. mourei* and *R. harrisoni* + the undescribed female. However, in the second case, *R. mourei, R. harrisoni,* and the undescribed female all share an orbicular labral basal elevation, lacking the

bilobed structure seen in *R. liebherri* and *R. pumilla.* In the opinion of the author, the second situation is probably more strongly supported.

ACKNOWLEDGMENTS

C. D. Michener and J. G. Rozen, Jr., carefully read an earlier version of the manuscript. I am grateful for their comments which helped to improve the final version. The following individuals kindly provided material that was used in this study: R. W. Brooks (Snow Entomological Museum, University of Kansas), L. Packer (York University), J. G. Rozen, Jr., and E. Quinter (American Museum of Natural History), J. Huber and L. Dumouchel (Canadian National Collection), and J. K. Liebherr (Cornell University Insect Collection, Cornell University). I am indebted to D. A. Yanega for bringing to my attention the Argentine male of *R. harrisoni* in the Canadian National Collection. Additional thanks go to my special committee; J. K. Liebherr, R. G. Harrison, T. D. Seeley, and C. D. Michener; for their support of my studies on the systematics of the Augochlorini. I am grateful for support provided by the New York Entomological Society and from a National Science Foundation Predoctoral Fellowship.

LITERATURE CITED

Eickwort, G. C. 1969. A comparative morphological study and generic revision of the augochlorine bees (Hymenoptera: Halictidae). Univ. Kans. Sci. Bull. 48:325–524.

Eickwort, G. C. 1979. Mites associated with sweat bees (Halictidae). Pages 575–588 *in* J. G. Rodriguez (ed.), Recent Advances in Acarology, 1. Academic Press, NY.

Eickwort, G. C. 1994. Evolution and life-history patterns of mites associated with bees. Pages 218–251 *in:* M. A. Houck (ed.), Mites: Ecological and Evolutionary Analysis of Life-History Patterns. Chapman and Hall, NY.

Moure, J. S. 1947. Novos agrupamentos genéricos e algumas espécies novas de abelhas sulamericanas. Publcoes. Avuls. Mus. Parana. 3:1–37.

Sakagami, S. F. and K. Fukushima. 1961. Female dimorphism in a social halictine bee, *Halictus* (*Seladonia*) *aerarius* (Smith), (Hym., Apoidea). Jpn. J. Ecol. 11:118–124.

Sakagami, S. F. and J. S. Moure. 1965. Cephalic polymorphism in some Neotropical halictine bees (Hymenoptera-Apoidea). An. Acad. Bras. Cienc. 37:303–313.

Received 6 March 1996; accepted 13 May 1996.